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$$\therefore \frac{1}{p^2} = \frac{2(1+e\cos\theta)-(1-e^2)}{l^2} = \frac{2u}{l} - \frac{1}{al}.$$

Hence (1) may be written  $v^2 = \frac{h^2}{l} \left( \frac{2}{r} - \frac{1}{a} \right)$ .

Also solved by the Proposer.

### DIOPHANTINE ANALYSIS.

**132.** Proposed by DR. OSWALD WEBLEN, Princeton University, Princeton, N. J.

From the numbers, 0, 1, 2, ..., 42, select seven, such that the 42 differences of these seven numbers shall be congruent (mod. 43) to the numbers 0, 1, 2, ..., 42. The differences may be both positive and negative.

Discussion by F. H. SAFFORD, Ph. D., University of Pennsylvania.

For convenience, let a circle be divided at 43 points, numbered consecutively from 0 to 42. Take any seven of these *numbers* and call the number of spaces between adjacent numbers *intervals*. The 42 differences of these seven numbers are obtained by taking the seven intervals together with all possible sums of *adjacent* intervals, two, three, ..., six, at a time. All differences may be considered positive by this method.

In order that the seven *numbers* may be a solution it is necessary and sufficient that the *intervals* shall possess the following properties:

(1) They shall be so selected that their sum is 43.

(2) They shall be capable of being arranged so that their sums, taken one at a time, two adjacent, three adjacent, etc., shall all be different. It will be evident that no interval can be 0, otherwise the differences will not be all distinct. Also 1 and 2 must be intervals, while if 3 is not an interval 4 must be, in order to provide for the differences 1, 2, 3, 4.

It is not difficult to write the totality of selections for (1), and there are 77 of them.

In permuting each of the 77 sets, it will be found by trial that no set will satisfy (2). Hence the problem is impossible.\*

### AVERAGE AND PROBABILITY.

**160.** Proposed by J. F. LAWRENCE, A.B., Professor of Mathematics, Oklahoma Agricultural College, Stillwater, Okla.

Two points are taken at random in a triangle, the line joining them dividing the triangle into two portions. Find the mean value of that portion containing the center of gravity.

No solution has been received.

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\*There are solutions of the corresponding problem in which 43 is replaced by 3, 7, 13, or 21. See proposed problem 142. Ed. D.